SUSTAINABLE DEVELOPMENT AND HOUSING

RESEARCH PAPER NO. 1

THE ORIGINS OF SUSTAINABLE DEVELOPMENT AND ITS RELATIONSHIP TO HOUSING AND COMMUNITY PLANNING

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EXECUTIVE SUMMARY

This paper is a background study, the purpose of which is to explore the emergence of the concept of sustainable development in Canada and to briefly relate sustainable development to Canadian housing, community planning, and Canada Mortgage and Housing Corporation (CMHC). The paper is divided into two sections. The first section reviews some of the major events in history which have contributed to our present understanding of the concept of sustainable development. The second section relates sustainable development to CMHC, outlines the main challenges it poses for the housing industry, and discusses the substantive and procedural issues surrounding the development of more sustainable communities.

1.0 THE ORIGINS OF THE CONCEPT OF SUSTAINABLE DEVELOPMENT

- Environmental consciousness has ebbed and flowed throughout history, closely paralleling the changing attitudes, perceptions and values of various dominant cultures. In North America, evidence suggests that man-induced environmental imbalances fostered the first environmentally responsible attitudes approximately 10,000 years ago when a great wave of humans crossed Bering Strait in order to reach the rich land left behind by the glaciers of the last ice age. The lush environment led to North America's first population explosion. However, improvident hunting and other human interventions eventually led to the decline of numerous species. This in turn disrupted large ecosystems and devastated indigenous populations. The experience is believed to have contributed to the emergence of indigenous peoples' unique relationship with the Earth, expressed in their culture, knowledge, practices and careful stewardship of the living Earth.

- With the arrival of the Europeans starting in the fifteenth century, indigenous peoples' ecological perspective was gradually overwhelmed as the fur trade, slash and burn land clearing practices, and later, the Industrial Revolution, ran their respective courses with little or no regard for the environment. This disregard for the environment was the beginning of what the renowned U.S. conservationist, Aldo Leopold, would later describe as a "land-relation" which is strictly economic, entailing privileges but not obligations.

- The first international event to address the environmental problems that arose from this strictly economic land relation was the U.N. Conference on the Human Environment held in 1972, in Stockholm, Sweden. At the end of the conference, the official delegates passed the "Declaration on the Human Environment" - 109 resolutions for action dealing with matters that had to be acted upon by nations, media and citizens alike. From these, the world has seen the emergence and growth of such organizations as: United Nations Environment Programme (UNEP); World Conservation Strategy; Ocean and Seas Action Plan; Earth Watch; and World Heritage.

- In the wake of the Stockholm Conference, a uniquely Canadian response to environment-development dilemmas was delivered in 1976, by Justice Thomas R. Berger in The Report of the Mackenzie Valley Pipeline Inquiry. The pipeline proposal mobilized powerful economic interests, however, in spite of the massive public relations campaign by the applicants, Canadians became disturbed by the environmental and native issues. It turns out that the humanitarian and ecological values so eloquently espoused in the Berger Report fairly accurately reflected the values widely held by the vast majority of Canadians towards their North.

° By the 1980s, environmental consciousness around the world was at an all time high as the cumulative effects of development and its accompanying environmental degradation reached global proportions. According to a Focus Canada Survey, in 1987, the Canadian public ranked environmental issues ahead of the state of the economy and the federal deficit. A 1989 Decima Poll, also confirmed an unprecedented number of Canadians who identified environmental issues as the most serious problem facing the country. Similar sentiments about the environment have been documented throughout the world.

° In response to this consensus of opinion, in 1987, the World Commission on Environment and Development (WCED), chaired by Norwegian Prime Minister Gro Harlem Brundtland, presented the report Our Common Future to the General Assembly of the United Nations. Discussion and debate on the Report led to a UN Resolution calling upon governments of all Member States to develop policies, programmes and budgets to support "sustainable development", a term which implies meeting the needs of the present without compromising the ability of future generations to meet their own needs.

° The need for more sustainable development is based on the UN's estimation that the world's population could stabilize at between 8 and 14 billion sometime next century; and our current $13 trillion world economy could grow five- or tenfold in the coming half-century. Much of this projected economic growth will continue to extract raw materials from forests, soils, seas and waterways, and will be accompanied by new forms of pollution as the world continues to invest in houses, transport, farms and industries.

° Based on the realities of present institutions and on what can and must be accomplished today, the Commission noted a number of actions that must be taken to put future development on paths that are sustainable:

1) a less compartmentalized and more integrated approach to resource management;
2) an "anticipate and prevent" approach to environment and development problems; and,
3) the development of National and Subnational Conservation Strategies to bring the process of conservation and development closer together.

2.0 KEY THEMES FOR CANADIAN HOUSING AND FOR CMHC

° As the federal government's housing agency, actively engaged in building and community research and development, CMHC is well positioned to facilitate the advancement of more sustainable communities in Canada. This is in keeping with the leadership role CMHC has historically played in improving Canadian housing and living conditions.

° For example, in the wake of the enormous demand for housing after the Second World War, the Corporation's housing policies, supported by the provisions of the 1947 National Housing Act (NHA), brought some measure of much needed control over the subdivision and use of land. Policies to support private market housing for instance, entailed not only measures to supply mortgage funding, but also to develop new standards for new construction and to explore new housing technologies and approaches. These initiatives led all levels of government to implement effective regulations regarding land subdivision, zoning, and development standards. Other policies concerning equity and social justice

in housing, led to the development of a range of programs which provide housing assistance for needy Canadians.

- Whereas CMHC has, and continues to be a leader in terms of ensuring the provision of sufficient numbers of "adequate" housing units to Canadians of all income groups, in order to remain in the forefront of housing, the Corporation is now focusing more intently on housing as part of the broader surrounding environment.

- For example, as part of its mandate to improve housing and living conditions, CMHC is engaged in a number of activities which address the linkages between our homes, our communities and the environment. This has included research work on: the energy intensity of building materials, residential water conservation, ground source heat pumps, integrated community energy systems, life-cycle costing, environmentally-preferred community development patterns, and more.

- Viewed as a series of building blocks that will help advance the development of more sustainable houses and communities in the future, these research initiatives, and others, are contributing significantly towards Canada's preliminary understanding of "sustainable community development". As the following diagram developed by CMHC in connection with its participation in "Globe '90" illustrates, the Corporation's position is that sustainable community development necessarily implies not only the need to achieve economic objectives and to maintain ecological integrity, but also to consider the importance of a variety of social considerations, such as housing affordability, community equity, and responsiveness to changing demographic and other conditions.

A SYSTEMS PERSPECTIVE ON SUSTAINABLE COMMUNITIES

- Viewing the house as a system within a larger community system, the challenge of residential sustainability presents itself on two separate fronts. The first is the challenge of developing a more environmentally benign, or a more sustainable dwelling unit. The second is to situate this dwelling unit in the broader community context using a more

sustainable community planning and development process. Some of the key house-specific and planning issues include:

House-Specific Issues - Building, Occupancy and Renovation/Demolition Stages:

Building Stage:

1) The energy intensity of building materials: *For example, the typical woodframe house requires approximately one-third less gross energy than do the main alternatives, steel or concrete.*

2) The land required for residential construction waste: *An average of more than 2.5 tonnes of waste is produced in the construction of one new dwelling unit, and as much as 10% of all the lumber purchased for construction ends up as waste.*

Occupancy Stage:

3) The energy spent to operate existing dwelling units: *Residential end-uses account for approximately 20% of total energy demand in Canada.*

4) The fresh water required by the occupants (largely determined by household water-consuming appliances and lawn watering): *Municipal water use, of which the residential component accounts for over 63%, has undergone a general upward trend, rising from 3,157 million m^3 in 1972 to 4,263 million m^3 in 1981.*

5) The land required for household waste: *The average Canadian produces about 1.7 kg of garbage per day.*

Renovation/Demolition Stage:

6) The land required for renovation and demolition waste: *In a 1989 survey of 100 licensed renovation firms, it was determined that over a 12 month period, over 8,000 re-usable items were sent to landfill sites: 711 kitchen sinks; 455 bathtubs; 570 refrigerators; 3,777 interior doors; and 2,611 exterior doors. There are tens of thousands of licensed renovation firms across Canada and countless informal operations adding to these numbers on an ongoing basis.*

Broader Community Issues - Planning Stage:

1) The land required for residential subdivisions: *Residential development patterns and the roads they necessitate typically consume over 50% and 20% respectively of the average city's total land area.*

2) The resource and energy intensity of the infrastructure required to service prevailing residential development patterns: *A single-family detached house requires approximately four times more linear infrastructure per unit than a duplex.*

3) The energy required to commute to and from existing dwelling units: *Fully 77% of all Canadian households own one or more automobiles, and 73% of all journeys to work are made by car.*

4) The housing stocks' responsiveness to changing demographics and changing housing demands and needs: *The 65+ age group will grow significantly from 1981 to 2001 (2.8 to 3.9 million), and within the group, the percentage made up of the over 75 population will increase from 36% to 44%.*

5) The pollution of receiving waters by residential wastewater discharges (largely determined by the adequacy of sewage treatment facilities): *Apart from obsolete and deteriorating systems in many parts of the country, as of 1985, some 8 million Canadians still resided in municipalities where no sewage treatment had yet been provided to protect their receiving waters.*

6) The pollution of receiving waters by urban runoff (largely determined by the amount land covered with impermeable surfaces and the treatment of storm water runoff): *A 1977 study of Washington D.C. concluded that the concentration of suspended solids in water from city streets was 104 times greater than effluent from secondary sewage treatment plants; the lead concentration was 1,025 times higher.*

- Implementing many of the known solutions to these problems will require a community planning process comprehensive enough to consider all of the issues, and sensitive enough to evaluate development alternatives, and their inherent trade-offs, in a manner consistent with changing attitudes, perceptions and values.

- Such a community planning process would routinely re-examine prevailing land use regulations, which, in many instances, have been identified as the underlying cause behind resource intensive development patterns as well as problems of affordability. For example, in already-developed areas, zoning ordinances, which differentiate land use categories spatially, identifying the use to which a parcel of land may be put (and, if applicable, building type, height, floor area ratio, and placement on the lot), often prevent the development of a variety of innovative housing options, many of which either enhance affordability, reduce residential impacts on the natural environment, or both.

- Fundamental urban planning concepts routinely employed in subdivision design will also have to be re-examined, including such concepts as the **Garden Suburb**, the **Neighbourhood Unit**, and the **Radburn Plan**. These concepts continue to be drawn upon by Canadian planners as heavily as those from any other era. While initially designed to relieve the problems of local pollution and urban squalor, the mass implementation of these garden-oriented suburban communities has inadvertently contributed to today's more far reaching environmental problems.

- Generally, what is required to affect the necessary changes in the areas of land development standards and urban planning concepts, is the incorporation of sustainable development principles, as the number one priority, into the community planning process. Whereas lawyers, architects, and engineers have and continue to play a substantial role in planning for the physical environment of a community, ecologists and environmentalists

will now be required to become more actively involved. In fact, this has been the case in recent years and has led to the development of new, more ecosystem-oriented planning tools such environmental impact assessment. What is required is leadership at all levels of government to help ensure that this, and other similar planning tools are meaningfully incorporated into all aspects of the community planning process.

The next research paper in this series, "Towards An Investigation Of Sustainable Housing", will begin to examine more closely the impacts of prevailing patterns of residential development on the natural environment, and the opportunities that exist for housing to become more sustainable in the future.

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INTRODUCTION

Environmental consciousness has come a long way in Canada. One hundred years ago the main environmental goals were to protect selected areas as national parks and wildlife sanctuaries against the ravages of industrialization. During the 1960s and 1970s, environmentalists focused on the "point-source" waste coming out of smokestacks and sewers by lobbying for bigger waste-treatment facilities and regulations to control the amount of pollution produced. More recently, the persistence of global environmental deterioration has provided common cause for modern environmentalists whose concerns now extend far beyond their immediate surroundings. Increasingly, the "react and cure" solutions of earlier decades are being rejected in favour of integrating economic and environmental considerations under the auspices of "sustainable development", a concept defined in 1987, by the World Commission on Environment and Development (WCED), in its publication Our Common Future, commonly known as The Brundtland Report.

PURPOSE

This paper is a background study, the purpose of which is to explore the emergence of the concept of sustainable development in Canada and to briefly relate sustainable development to Canadian housing, community planning, and Canada Mortgage and Housing Corporation (CMHC).

BOUNDARIES OF DISCUSSION

The paper is divided into two sections. The first section reviews some of the major events in history which have contributed to our present understanding of the concept of sustainable development. Pre-historic and early North American environmental ethics are examined, followed by a discussion on some contemporary forerunners of the concept of sustainable development. The latest interpretation of sustainable development is then introduced by reviewing the main points of the Brundtland Report. The second section relates sustainable development to CMHC, outlining the Corporation's understanding of, and its potential role in, the advancement of community sustainability. The social, economic and environmental challenges for the housing industry are then reviewed, with specific reference to the threat posed by global warming. Finally, the substantive and procedural issues surrounding the development of more sustainable communities are discussed.

1.0 THE ORIGINS OF THE CONCEPT OF SUSTAINABLE DEVELOPMENT

1.1 Early Environmental Ethics: Native North Americans

The story of the evolution of Native American environmental ethics is directly relevant to current discussions on sustainable development. Understanding the importance of early man-environment relationships and of the resultant ecological changes, enables us to place recent changes in a broader context and helps isolate natural and man-induced changes. It is essential therefore for understanding global change as it provides examples of historic scenarios which may be analogues for future events.

Evidence suggests that man-induced environmental imbalances fostered the first environmentally responsible attitude in North America approximately 10,000 years ago when a great wave of humans crossed Bering Strait to reach the rich land left behind by the glaciers of the last ice age.[1] The lush environment led to North America's first population explosion (approximately 3.4% growth per year). However, improvident hunting and other human interventions, such as fire, eventually led to the decline of numerous species. Studies show that during the Pleistocene period, man could have met his food needs with 5% of the animals he was apparently responsible for killing.[2] As the number of North American

species decreased and surviving species dwindled, the ecosystems of large areas were disrupted and indigenous populations were devastated. The experience is thought to have contributed to the emergence of indigenous peoples' unique relationship with the Earth, expressed in their culture, knowledge, practices and careful stewardship of the living Earth.[3] In 1853, Chief Seattle of the Dwamish Nation made this eloquent statement:

> "Whatever befalls the Earth befalls the sons of Earth. Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself."[4]

1.2 Early North America

The story of the demise of indigenous people and their ecological perspective, or, alternatively, of the rise of a decidedly more anthropocentric ethic is well known. In North America, the establishment of European colonies starting in the fifteenth century, and the advent of commerce and trade, rendered environmental considerations a marginal priority in the decision-making process. The fur trade, slash and burn land clearing practices, and later the Industrial Revolution, spawned by capitalism and the technological innovations of the eighteenth and nineteenth centuries, ran their respective courses with little or no regard for the environment. Isolated outcrys on behalf of environmental protection could be heard on both sides of the Atlantic. However, early scientific warnings, such as R.A. Smith's 600-page book on the subject of acid rain, published in England in 1872, and later elaborated on by Dr. E. Gorham of Canada, were routinely ignored.[5] This disregard for the environment was the beginning of what the renowned U.S. conservationist, Aldo Leopold, would later describe as a land-relation which is strictly economic, entailing privileges but not obligations.

1.3 Contemporary Forerunners Of Sustainable Development: The 1960s And '70s

As "economic-man" continued to exploit the earth's resources on an ever-increasing scale, concern for the environment and understanding of its importance to human well-being increased dramatically, particularly in the post-war era. The evidence that in some areas the quality and productivity of the environment had been, and were being, degraded, led to fears that we would push use of our environment too far. This anxiety bred a desire for both reliable knowledge and mitigative action.

1.3.1 Increasing Environmental Literacy

In the 1960s and '70s, several classic documents, such as Rachel Carson's Silent Spring (1964), and E.F. Schumacher's Small is Beautiful (1973), increased environmental awareness and understanding and sensitized people to the reality of large-scale environmental degradation around the globe. In 1972, The Club of Rome's Limits to Growth startled us with the conclusion that we were running out of non-renewable resources. The report generated environmental awareness and actions, but it also contributed to increased polarization of environmental and economic interests.

These documents and others, the environmental movements they fuelled, and the proliferation of Environmental Non-Government Organizations (ENGOs), led to and continue to legitimize the existence of official government agencies and departments charged with responsibility for environmental protection. In Canada, a department or ministry of the environment was virtually unheard of just 20 years ago. Since then, literally hundreds of policies, programs and legislation to protect the environment have been implemented in Canada and around the world. However, very little real progress has been made in the

international domain. As the Honourable Tom McMillan, former Environment Minister for Canada, has stated:

> "The world's environmental problems are greater than the sum of those in each country. Certainly, they can no longer be dealt with purely on a nation-state basis. The challenge ahead is for us to transcend the self-interests of our respective nation-states so as to enhance a broader self-interest -- the survival of the human species in a threatened world."[6]

1.3.2 The Stockholm Conference

The first international event to address this global challenge was the U.N. Conference on the Human Environment held in Stockholm, Sweden, June 5-16, 1972. The Stockholm Conference was the first large-scale internationally organized conference on the environment. For the first time, the primary objective of the meeting was defined as consciousness raising. Since information and its dissemination was assigned top priority, Maurice Strong of Canada, Secretary-General of the "Stockholm Conference", travelled extensively, extending invitations to both government and non-governmental organizations (NGOs). Literally thousands of government, youth, NGO and media representatives showed up. In the end, the official delegates passed the "Declaration on the Human Environment" - 109 resolutions for action dealing with matters that had to be acted upon by nations, media and citizens alike, as well as resolutions on institutional and financial arrangements for cooperation. From these, the world has seen the emergence and growth of such organizations as: United Nations Environment Programme (UNEP); World Conservation Strategy; Ocean and Seas Action Plan; Earth Watch; and World Heritage. The Stockholm Conference thus became synonymous with grassroots participation, media and public awakening to the realities of environmental dangers, and the founding of a string of organizations and events centred on environment and development.

1.3.3 The Report of the Mackenzie Valley Pipeline Inquiry

In the wake of the Stockholm Conference, a uniquely Canadian response to environment-development dilemmas was delivered by Justice Thomas R. Berger in The Report of the Mackenzie Valley Pipeline Inquiry. In 1976, the release of the Berger Report and the Report's aftermath established the precedent that economic development in Canada's North would not be handled in the same way as it is in the South. The Report, written with a clear sense of conviction for the environment and the social problems of the North, also enshrined the principle that economic development could be stopped by environmental veto.[7] In the final analysis, the Berger Report broke new ground in several important ways and set new standards for achieving wide levels of public participation. According to Justice Thomas Berger:

> "There is a myth that terms and conditions that will protect the environment can be imposed, no matter how large a project is proposed. There is the assumption that when enough studies and reports have been done all will be well. It is an assumption that implies that choice we intend to take. It is an assumption that does not hold in the North."[8]

For many, Arctic pipelines became a symbol of what was wrong with our growth-oriented, energy-intensive society. The pipeline proposal mobilized powerful economic interests, including multinational oil companies, banks, steel companies and North American gas utilities. However, in spite of the massive public relations campaign by the applicants, Canadians became disturbed by the environmental and native

issues.[9] It turns out that the humanitarian and ecological values so eloquently espoused in the Berger Report fairly accurately reflected the values widely held by the vast majority of Canadians towards their North. Unfortunately, within the more populous parts of the country, there is no similar consensus that could help define the criteria for environment-economy trade-offs. The issues are not nearly as clear-cut as a pipeline versus Canada's pristine Northwest, and consequently the challenge of sustainable development in the populated south promises to be considerably more complex.

1.3.4 The 1970s: A Progress Report

While the decade following the Stockholm Conference witnessed a proliferation of environment-friendly attitudes and actions around the developed world, it is likely that the OPEC-induced energy "crises" of 1973 and 1979 were the driving forces behind the many temporary "conserver societies" that emerged during this period. The conservation attitudes produced some tangible environmental benefits, though these were often just side-effects of less altruistic motives (i.e. there is general agreement that, prior to the recent fall in oil prices, the growth of energy efficiency at a rate of 2% annually in some developed countries, was driven largely by higher energy prices, triggered mainly by higher oil prices).

Moreover, regardless of our efforts in the 1970s, to conserve gasoline in light of perceived shortages, current research documenting the multiple and cumulative effects of ongoing environmental degradation testifies to the extent of environmental irresponsibility which persisted throughout the 1960s and '70s. During the 1970s, twice as many people suffered each year from so-called "natural" disasters as during the 1960s. The disasters most directly associated with environment and development mismanagement - droughts and floods - affected the most people and increased most sharply in terms of numbers affected. Some 18.5 million people were affected by drought annually in the 1960s, 24.4 million in the 1970s; and there were 5.2 million flood victims yearly in the 1960s, 15.4 million in the 1970s.[10]

1.4 The 1980s: Increasing Global Environmental Concern

Environmental consciousness around the world reached an all time high in the 1980s, as the cumulative effects of development and its accompanying environmental degradation reached global proportions. When the century began, neither human numbers nor technology had the power to radically alter planetary systems. As the century closes, not only do vastly increased human numbers and their activities have that power, but major unintended changes are occurring in the atmosphere, in soils, in waters, among plants and animals, and in the relationships among all of these.

There are environmental trends that threaten to radically alter the planet and that threaten the lives of many species upon it, including the human species. Each year another 6 million hectares of productive dryland turns into worthless desert; over three decades this would amount to an area roughly as large as Saudi Arabia.[11] More than 11 million hectares of forests are destroyed yearly, and this, over three decades, would equal an area about the size of India.[12] Much of this forest is converted to low-grade farmland unable to support the farmers who settle it. Also, industry and agriculture continue to put toxic substances into the human food chain and into underground water tables beyond the reach of cleansing.

In Europe and North America, acid precipitation kills forests and lakes and damages the artistic and architectural heritage of nations. It may have acidified tens of thousands of lakes and vast tracts of soil beyond any reasonable hope of repair. All around the world, human activities, particularly deforestation and the burning of fossil fuels, emit greenhouse gases into the atmosphere, which is causing gradual global warming. This "greenhouse effect" may, by early next century, increase average global temperatures

enough to disrupt national economies. Agricultural production areas will likely shift. Lakes and rivers could be reduced in volume and flow. Shipping, forestry, recreation and fishing will be affected, and sea levels will increasingly threaten coastal cities with flooding. Other industrial gases threaten to deplete the planet's protective ozone shield to such an extent that the number of human and animal cancers would rise sharply and the oceans' food chain would be disrupted.

These trends have, in more recent times, prompted increased concern for environmental matters. According to a Focus Canada Survey, in 1987, the Canadian public ranked environmental issues ahead of the state of the economy and the federal deficit. A Decima Poll conducted in 1989, also confirmed an unprecedented number of Canadians who identified environmental issues as the most serious problem facing the country. Other polls have demonstrated the same general shift in attitude around the developed world.

1.4.1 The World Conservation Strategy Conference

The above public opinion polls, along with the activities of ENGOs, have been instrumental in shaping new political attitudes and in keeping the environment on national and international agendas. For example, in 1986, during Canada's Environment Week, the World Conservation Strategy Conference in Ottawa examined progress in implementing the World Conservation Strategy (WCS). Organized and written by Robert Prescott-Allen, this plan was adopted by the International Union for Conservation of Nature and Natural Resources (IUCN) and endorsed by Canada in 1981. The conference, attended by more than three hundred decision-makers and professionals in development and planning, conservation and environmental management, from countries around the world, was a week-long examination of strategies and programs to promote sustainable economic development of renewable resources. The emphasis that sustainable livelihood is a process totally harmonious with nature, and the rejection of the separation that used to be made between man and nature, represents an advance from the original World Conservation Strategy, which suggested that the conservation of nature and the protection of the biosphere is crucially important, but had to be accomplished while meeting the needs of the people (no connection implied).

The conference ended on a hopeful note. For the first time in the 40-year history of the United Nations there was almost unanimous agreement that the nations of the world must unite to combat poverty and war. In fact, poverty and the wars it engenders were labelled as the most significant threats to the global environment - a resolution reminiscent of Indira Gandhi's speech in Stockholm in 1972, stating that, above all, "pollution is poverty".

1.4.2 The Third Biennial Conference On The Fate Of The Earth

Also in 1986, the Third Biennial Conference on the Fate of the Earth was held in Ottawa and endorsed by 225 organizations. The conference followed two previous conferences on the Fate of the Earth, which were held in New York (1982) and in Washington D.C. (1984). The conference involved ten days of meetings, workshops, panel discussions, concerts and multi-media presentations that saw from 600 to 800 people from more than 100 countries gather together to discuss global issues. The workshops and informal get togethers were designed to draft recommendations and preliminary position papers on a wide variety of issues. Environmental, peace and development movements were brought together to discuss the interrelated threat to the Earth and the creation of integrated strategies for overcoming these threats. The Conference combined input from the grassroots community organizations level with that of the national organizations.

1.4.3 The 1980s: A Progress Report

Throughout the 1980s, there has been much discussion by many different actors and agencies from all around the world concerning man's impact on the natural environment, the limits of the earth's tolerance and resilience, and man's necessarily subordinate position within nature. Unprecedented in scale and scope, a general consensus has emerged around the world which binds all countries together in a common cause. This consensus is encompassed by the term "Sustainable Development".

1.5 Sustainable Development As Defined By The WCED

In April 1987, The World Commission on Environment and Development (WCED), commonly known as the Brundtland Commission, published the report Our Common Future, and presented it to a special Plenary Session of the General Assembly of the United Nations. Canadians can be particularly proud of their connection to the Brundtland Report. Not only was Canada one of the largest financial contributors to the WCED, but much of the intellectual nourishment and behind the scenes zeal came from Canadians.[13] Canadian representative on the Commission, Maurice Strong, and the Commission Secretary General, Dr. Jim Macneill, were both important players in the success of the report.

The establishment of the WCED in 1983, by a UN resolution reflected the conviction that it is possible to build a future that is more prosperous, more just and more secure because it rests on policies and practices that are both ecologically and economically sustainable. In November 1987, discussion and debate on the Report led to a UN Resolution calling upon governments of all Member States to develop policies, programmes and budgets to support "sustainable development", a term which implies meeting the needs of the present without compromising the ability of future generations to meet their own needs.[14] Sustainable development also assumes that economic well-being and environmental protection go hand in hand and that one cannot occur at the other's expense. The following main points of Our Common Future further clarify the concept. Unless otherwise indicated, all facts, figures and trends are drawn directly from the Brundtland Report.

1.5.1 The WCED's Mandate

Recognizing that the next few decades are crucial in terms of the survival of the planet as we know it, and that the time has come to break out of past patterns, the Brundtland Commission's mandate gave it three broad objectives:

> 1) to re-examine the critical environment and development issues and to formulate realistic proposals for dealing with them;
> 2) to propose new forms of international cooperation on these issues that will influence policies and events in the direction of needed changes; and
> 3) to raise the level of understanding and commitment to action of individuals, voluntary organizations, businesses, institutes, and governments.[15]

1.5.2 The Brundtland Report's Main Points

According to the WCED, since the stresses currently being placed on the biosphere are simply unsustainable, in both developed and developing countries, all nations must integrate environmental considerations into economic decision-making. In calling for accelerated economic development that respects the natural environment as a means of addressing ecological concerns, particularly in the Third

World, the report, in effect, challenges the "Limits To Growth" theory espoused by the Club Of Rome nearly twenty years ago. Some of the report's other main points include:

The Third World: Poverty Is Pollution - Throughout the Brundtland Report, the WCED reiterates that widespread poverty is the single greatest threat to the global environment. Over the past few decades, life-threatening environmental concerns have surfaced in the developing world as countrysides continue to come under pressure from increasing numbers of farmers and the landless, and as urban migration continues to fill up cities with people, shanty towns, cars and factories. In many parts of the world, the population is growing at rates that cannot be sustained by available resources, at rates that are outstripping any reasonable expectations of improvements in housing, health care, food, security, or energy supplies.

While urgent steps are needed to limit extreme rates of population growth, the issue is not just numbers of people, but how these numbers relate to available resources. Developing countries are being forced to operate in a world in which the resources gap between "have" and "have-not" nations is widening. In many developing countries where the export of primary resources generates approximately half of the gross national product (and accounts for even larger shares of livelihoods and employment), the international economic system continues to increase rather than decrease inequality, and increase rather than decrease numbers of poor and hungry. By pressuring these countries into over-exploiting and thus bankrupting their fragile resource bases, this inequality is at once the planet's main environmental and its main development problem.

The recent crisis in Africa perhaps best and most tragically illustrates the ways in which economics and ecology can interact destructively and trip into disaster. Triggered by drought, the real causes of mass starvation are to be found in part in national policies that gave too little attention, too late to the needs of smallholder agriculture, and to the threats posed by rapidly rising populations. The causes also extend to the global economic system that takes more out of developing nations than it puts in. For example, in many cases, debts that they cannot pay force developing nations relying on commodity sales to overuse their fragile soils, thus turning good land to desert. Also, trade barriers in both wealthy and developing nations, make it hard for developing nations to sell their goods for reasonable returns, putting yet more pressure on ecological systems.

Throughout the Third World, perhaps the most visible symptom of the combined effects of these and other similar problems, has been the decline of the planet's rain forests, a tradgedy from several standpoints, including economic and environmental. Concerning the latter, while a diversity of species is necessary for the normal functioning of the biosphere as a whole, the destruction of the rain forest around the world is contributing to the disappearance of species at rates never before witnessed on the planet. The lesson of early North Americans is perhaps worth recalling at this point. Economically, the genetic material in wild species contributes billions of dollars yearly to the world economy in the form of improved crop species, new drugs and medicines, and raw materials for industry. The future potential in these areas is enormous since, of the perhaps 30 million species of organisms on the planet, we have catalogued or documented less than 2%, or fewer than 600,000.[16] Other sources place the number of species identified at closer to 1.4 million.[17] In any event, the destruction of the rain forest is akin to burning a library that hasn't been read and would take some 25,000 professional lifetimes to do so.[18]

The Role Of The Developed World And The Need For Fundamental Changes In Attitudes, Perceptions And Values - The ecological pressures described above are not expected to subside in coming years. According to UN projections, the world population could stabilize at between 8 and 14 billion sometime next century, and our current $13 trillion world economy could grow five- or tenfold in

the coming half-century. Much of this projected economic growth will continue to extract raw materials from forests, soils, seas and waterways, and will be accompanied by new technology and its inherent high risks (i.e. new forms of pollution). In brief, the figures reflect and presage profound risks upon the biosphere as the world continues to invest in houses, transport, farms and industries.

The industrialized world has a critical role to play in ensuring that this development takes place in a more sustainable manner. According to the Brundtland Report, one priority is the need to re-allocate scarce resources away from continually growing global military expenditures (currently totalling approximately $1 trillion per year). Also, multinational corporations and lending institutions will have to re-think their investment strategies with a view to more sustainable development practices, particularly in the Third World where their presence is the overwhelming influence on the type of development which takes place.

Overall, the WCED has noted a number of actions that must be taken to reduce risks to survival and to put future development on paths that are sustainable:

1) a less compartmentalized and more integrated approach to resource management;
2) an "anticipate and prevent" approach to developmental and environmental problems, and;
3) the development of National and Subnational Conservation Strategies to bring the process of conservation and development closer together.

The recommendations are based on the realities of present institutions and on what can and must be accomplished today. To achieve the needed changes, it was emphasized that active follow-ups of the report are imperative.

2.0 KEY THEMES FOR CANADIAN HOUSING AND FOR CMHC

With respect to alleviating global environmental stresses, the Brundtland Report states that the onus lies with no one group of nations, that the entire world must respond to the issues. Rene Dubos' dictum, "Think globally, act locally" is, therefore, particularly salient at this time. To act locally in a global context is to act nationally, and on this front Canada is relatively well advanced. For example:

Following the WCED's 1986 visit to Canada, the Canadian Council of Ministers of the Environment established a National Task Force on Environment and the Economy with a mandate to foster and promote environmentally sound economic development. A major recommendation by the Task Force was that the federal government, provinces and territories should each form multi-sectoral Round Tables, "to bring existing organizations together to cooperate on environment-economy integration". As of April 1990, the federal government and all provinces and territories had established their own round tables.

The Government of Canada has also prepared an Environmental Agenda for the country entitled "Canada's Green Plan" - a comprehensive national framework and action plan for implementing Canada's commitment to sustainable development. Its long-term objective is to maintain our natural environment for future generations by arresting any future degradation, while at the same time rebuilding our natural resource base. Some of the requirements of the Green Plan for the public sector include the application of a code of environmental ethics; the development of a process to assess the environmental implications of policy proposals; the incorporation of environmental auditing into normal internal auditing procedures; and, coordination with government-wide Green Plan communication efforts.

All of these initiatives presuppose a thorough understanding of how sustainable development relates to different sectors of the economy. Since present national institutions are still largely compartmentalized within general sectors (i.e. energy, agriculture, housing), it becomes the responsibility of each of these institutions to explore and pursue the avenues through which the concept of sustainable development may be applied to their respective jurisdictions of responsibility. Much of the Canadian effort in this respect has so far concentrated on our primary industries, however, it is absolutely critical that Canada's housing industry be aware of the contributions that can be made within the residential sector.

2.1 Sustainable Development And CMHC

Given the significance of housing in the context of improving the overall sustainability of Canadian cities, CMHC will be inextricably involved in the shift to more sustainable patterns of development. The role of CMHC (and other agencies) in this capacity was clearly appreciated in the Brundtland Report by virtue of the Commission's third objective in its mandate: to raise the level of understanding and commitment to action of individuals, voluntary organizations, businesses, institutes and governments. As a Crown Corporation, CMHC is able to influence the development of policies, programmes and budgets to support sustainable development in both the business and government sectors. Further, as the federal government's housing agency, actively engaged in building and community research and development, CMHC is well positioned to facilitate the development of more sustainable communities in Canada.

2.1.1 An Historical Perspective

Historically, CMHC has, and continues to play a leading role in improving Canadian housing and living conditions. For example, in the wake of the enormous demand for housing after the Second World War, the Corporation's housing policies, supported by the provisions of the 1947 National Housing Act (NHA), brought some measure of much needed control over the subdivision and use of land. Policies to support private market housing for instance, entailed not only measures to supply mortgage funding, but also to develop new standards for new construction and to explore new housing technologies and approaches. These initiatives led all levels of government to implement effective regulations regarding land subdivision, zoning, and development standards. Other policies concerning equity and social justice in housing, led to the development of a range of programs which provide housing assistance for needy Canadians.

There is no question that CMHC has made great strides in both of the above policy areas since the postwar period. Indeed, from a "quality of life" perspective, it can be argued that the Corporation's initiatives have succeeded in literally transforming the way the majority of Canadians live. It is now increasingly evident, however, that housing policy must no longer be viewed solely in terms of ensuring the provision of sufficient numbers of "adequate" housing units to Canadians of all income groups. Whereas CMHC has, and continues to be a leader in this respect, in order to remain in the forefront of housing, it is now focusing more intently on housing as part of the broader surrounding environment. In other words, the integrated nature of environment and development has led CMHC to begin considering not only those parts of the physical and social environments affected by their policies and decisions, but those parts of the natural environment affected as well.

2.1.2 Activities Which Relate To The Environment

In light of this new environmental dimension, as part of its mandate to improve housing and living conditions, CMHC is engaged in a number of activities that address the linkages between our homes, our communities and the environment. For example, internationally, CMHC has been advancing the understanding of sustainable community development through its participation in such organizations as, OECD-GUA (Organization for Economic Cooperation and Development - Group on Urban Affairs), UN-ECE/CHBP (United Nations - Economic Commission for Europe/Committee on Housing Building and Planning), UNCHS (United Nations Centre for Human Settlements), and UNCED (1992 United Nations Conference on Environment and Development - Brazil).

Nationally, CMHC has participated in all components of Canada's Green Plan consultation process, with a view to raising the community dimension of environmental questions, particularly the linkages which connect housing, living conditions, and urban development issues with sustainable development. CMHC also helped to develop a workshop held by the Canadian Institute of Planners, which examined the relationship between urban planning and sustainability. Support has similarly been directed to the Canadian Urban Institute, the National Housing Research Committee and others, for seminars, symposia, and publications focusing on sustainable communities.

The Corporation is also funding "Affordability and Choice Today" (A.C.T.), a national program concerned with meeting community housing needs, ensuring affordability, maintaining quality and increasing choice. The impetus behind the A.C.T. program includes such issues as: (i) outdated building and land use regulations that often prevent the use of cost-saving methods in land development, site planning, and building techniques; (ii) approval procedures that cause unnecessary delays, increasing costs; and (iii) building and land development regulations that often do not permit innovative approaches to housing, even though these approaches reflect the ongoing changes in household composition, size and lifestyles occurring across Canada.

Generally, A.C.T. encourages innovative approaches to address the interrelated social, economic and environmental dimensions of the above issues, either singly or in combination. For example, it is hoped that through the program, municipal regulatory reform will be encouraged, leading to changes in those zoning ordinances, site servicing, and other land development standards that inhibit the process of "residential intensification", a development option widely believed to yield substantial environmental, as well as social and economic benefits.

CMHC's in-house research activities which relate to the environment include an analysis of the many factors contributing to "quality of life", broadly defined. This has included research work on: energy intensity of building materials, residential water conservation, ground source heat pumps, integrated community energy systems, life-cycle costing, environmentally-preferred community development patterns, and more. Other work is examining housing risks associated with climate change, radon gas and toxic lands.

2.1.3 Understanding Sustainable Community Development

Rather than providing a clear framework, or blueprint for action to bring about more sustainable cities, or a more sustainable community development process, the above research, and associated activities, are viewed more as a series of building blocks that will help realize the development of more sustainable houses and communities in the future. By continually advancing the same critical dimensions of

sustainable communities, the activities have already contributed significantly to the emergence of a general consensus among researchers and city officials concerning the parameters of sustainable cities and the criteria by which their sustainability would be evaluated. This has significantly expanded Canada's, and indeed the world's, preliminary understanding of "sustainable community development".

As Figure 1, developed by CMHC in connection with its participation in "Globe '90", illustrates, the Corporation's position is that sustainable community development necessarily implies not only the need to achieve economic objectives and to maintain ecological integrity, but also to consider the importance of a variety of social considerations, such as community equity, and responsiveness to changing demographic and other conditions. Internationally, this, and other similar models, have prompted even wider definitions of community sustainability, which have included not only environmental and economic considerations, but social, cultural and physical (built) variables as well.

This expanded understanding of sustainable community, or urban development is of considerable importance, both because of the increasing dominance of urban areas in the world's population distribution, and because in Canada, as elsewhere, discussion of sustainable development is usually couched in terms of the relationship between economic growth and resource use on the one hand, and resource conservation and protection of the "natural" environment on the other.[19] It thus tends to exclude both the "human" dimension of development and the "built" environment, although the majority of Canadians are now urban-dwellers and cities are the locus of most social and economic activities (both intimately connected to the natural world).

FIGURE 1

A SYSTEMS PERSPECTIVE ON SUSTAINABLE COMMUNITIES

2.1.4 Roles For The Future

Although the meaning of sustainable development in the overall community context remains relatively poorly understood, (indeed the application of sustainable development in the context of an integrated urban and rural system is only just beginning to be addressed), the above CMHC "tri-pod" approach to more sustainable communities, in effect, revives earlier, more comprehensive, less compartmentalized community planning ideas that will be required to realize more sustainable development in the future.

These ideas came to Canada via a number of sources, but particularly through the efforts of Thomas Adams, a leading exponent of Ebenezer Howard's ideas and a planning advisor to the Canadian Commission of Conservation (established as an advisory body to the Government of Canada in 1909). The Commission's work embraced not only resource conservation and wise rural land use, but urban planning and public health. All of these were seen as discrete but nevertheless closely related aspects of the well-being of the body politic.

Adams' conviction that the physical well-being of the people is the resource from which all others derive value, made explicit the relationship between social welfare, housing, the environment and urban planning. His initial interest in housing and health was expanded to include a concern for harmonious arrangements among land uses, the provision of wide thoroughfares, the division of residential districts according to class of housing, and the need for public parks, playgrounds and open spaces.[20]

Today, CMHC is the principal federal government agency with an interest in such human settlement issues. Indeed, it has been suggested that, as the offspring of the Advisory Committee on Reconstruction's Subcommittee on Housing and Urban Planning, in a sense CMHC has become the latter-day Commission of Conservation.[21] With its central mandate anchored firmly in housing, the ultimate challenge for CMHC will be to develop policies which reflect the same holistic unity that our predecessors on the Commission recognized three-quarters of a century ago.

2.2 The Challenges Of Sustainable Community Development

The comprehensiveness implied by sustainable community, or urban development has given rise to many definitions of the concept intended to facilitate its implementation. One such definition, recently put forward for the Canadian Environmental Advisory Council is particularly relevant to CMHC:

> "Sustainable urban development might be defined as a process of change in the built environment which fosters economic development while conserving resources and promoting the health of the individual, the community and the ecosystem (recognizing that in terms of sustainability as in other matters, the urban environment cannot be separated from the region of which it is a part)."[22]

From a land-use planning perspective, this "process of change in the built environment" implies a reorganization of our cities' predominant functions or land uses, including: residential, transportation, office, commercial, institutional, industrial, and open space. The definition implies that it is vitally important that we reassess the long-term viability of each of these component parts of our cities and initiate the appropriate changes.

CMHC has a critical role to play in this process since the most obvious unsustainable relationship between land uses in Canada and the people they are intended to serve is exemplified by our sprawling residential development patterns and our consequent dependence on private modes of transportation, namely automobiles. Indeed, as is often pointed out, in combination, the private car and the single-family detached house have created what is arguably the single most important challenge to urban sustainability in Canada.[23] Based on social, economic and environmental criteria, this challenge consists mainly of reducing dependence on private cars, and creating residences that are at once, more affordable (for all income groups), more efficient (in the use of energy and other natural resources), and more sensitive to changing societal demands and needs (changing household composition).

2.2.1 The Housing Challenge

For the housing industry, the above, broad housing challenges encompass more specific social, economic and environmental problems that require immediate, practical solutions. For example:

Economically, housing is a large and critical sector of the economy. The share of total Gross Domestic Product (GDP) accounted for by total residential construction expenditures has ranged between four and seven percent over the postwar period.[24] Estimates also indicate that the $27.8 billion spent on residential construction in 1986, generated 1.05 million person-years of employment, just under 320,000 of these directly in the construction industry.[25] This is significant since at the heart of our urban environmental problems is our economic system which has yet to adequately incorporate long-term environmental considerations into its cost-benefit ratios. The housing industry is no exception to this general rule. The primary challenge for builders, therefore, will be to ensure that future developments are more environmentally responsible, without diminishing their competitiveness and thus their ability to provide adequate housing to Canadians of all income groups.

Socially, housing is a critical component influencing the overall health, happiness and prosperity of any given population. In the past, the deteriorated physical condition of Canadian housing, and the subsequent social repercussions, led CMHC to become actively involved in improving the overall "adequacy" of Canadian housing. As was mentioned above, the initiatives literally transformed the way the majority of Canadians lived. Today, at the level of the individual dwelling unit, the primary social challenges will be for the housing industry to respond to rapidly changing demographics, including: an aging population; increasingly smaller households; and a rate of household growth that is faster than the growth rate in the population as a whole. The housing industry must also respond to gradually shifting community attitudes, perceptions and values. For example, people today are consciously opting for situations in which they can enjoy a higher "quality of life", broadly perceived to include much more than just income. In fact, access to cultural and recreation opportunities, good educational facilities, an exciting mix of people with different cultural, professional and ethnic backgrounds, and a good quality environment are increasingly overriding other considerations.

Ecologically, housing has contributed significantly to the ongoing pressures being placed on Canada's natural environment, particularly on our energy, land and water resources. Municipal water use (of which the residential component accounts for over 63%) has undergone a general upward trend, rising from 3,157 million m^3 in 1972 to 4,263 million m^3 in 1981.[26] Further, as of 1985, some 8 million Canadians still resided in municipalities where no sewage treatment had yet been provided to protect their receiving waters.[27]

The spatial extent of our cities and its impact on otherwise renewable agricultural land is also substantially influenced by housing. Some 60% of Canada's existing housing stock is made up of single-family detached dwelling units. Since these dwellings are usually incorporated into development patterns which are much less dense than those normally associated with other house forms, they typically require much more land to accommodate any given population. For example, at an average of 45 persons per net hectare, single-family detached homes normally house some 58% less people per net hectare than row-houses (at an average of 108 persons per net hectare); approximately 71% less people than walk-up apartments (at an average of 156 persons per net hectare); and anywhere from 76% to 97% less people per net hectare than high density, multi-family housing.[28] In all, residential land uses (predominantly suburban), consume over 50% of the total area of typical Canadian cities. Along with the miles of roads

necessitated by these development patterns and the auto-oriented shopping malls they tend to encourage, our living arrangements easily account for over 70% of land use shares in Canadian cities.[29]

Although our decentralized settlements are at least partially responsible for the amount of energy consumed per capita in Canada, the overall energy implications of our development patterns are not entirely clear. What is known is that operating the existing stock of housing accounts for over 20% of the nation's total energy demand.[30] This figure reflects the fact that approximately 60% of all dwellings in Canada are single-family detached houses. It does not reflect the extra embodied energy associated with these houses, which require up to four times more infrastructure per unit than duplexes. Nor does it reflect the fact that these living arrangements have encouraged, and often necessitated, massive car ownership throughout Canada, with fully 77% of all Canadian households owning one or more automobiles, and 73% of all journeys to work being made by car.[31]

Overall, the real energy cost associated with our living environments, including construction, renovation, maintenance, demolition, building materials employed, the linear infrastructure required, and the commuting which is necessitated, is much more difficult to quantify. Nevertheless, it is generally agreed that prevailing patterns of residential development have in large part contributed to Canadians' dubious title as the highest per capita energy consumers in the world.

Finally, housing is also a major contributor to the municipal landfill problem in certain areas across Canada. For example, in the Greater Toronto Area, it is estimated that more than 90,000 tonnes of low-rise residential construction waste is produced per year.[32] This translates into an average of more than 2.5 tonnes per house for the average 35,000 housing starts annually in the area. And although this "new home construction" represents only 2-3% of all landfill waste, a far larger percentage comes from demolition. In all, some 16% of all landfill waste is from the construction industry,[33] approximately 30% (29.4) of which is accounted for by the residential sector.[34]

Housing is, therefore, a critical component influencing the overall resource efficiency of Canadian cities. Apart from the vast amounts of otherwise renewable agricultural land resources consumed by our houses and the transportation systems they necessitate, their near exclusive dependence on non-renewable fossil fuels is contributing to the ongoing problem of global warming.

2.2.2 The Challenge Of Global Warming

Studies of future climate, based on complex computer calculations, indicate that, over the next 50 years, average world temperatures could increase between 1.5 and 4.5 degrees Celsius if global carbon dioxide (or its equivalent) is doubled.[35] Present rates of greenhouse gas emissions would more than realize these concentrations of greenhouse gases in the atmosphere. One of the consequences of this global warming is an expected rise in mean sea level of between 20 and 140 centimetres.[36]

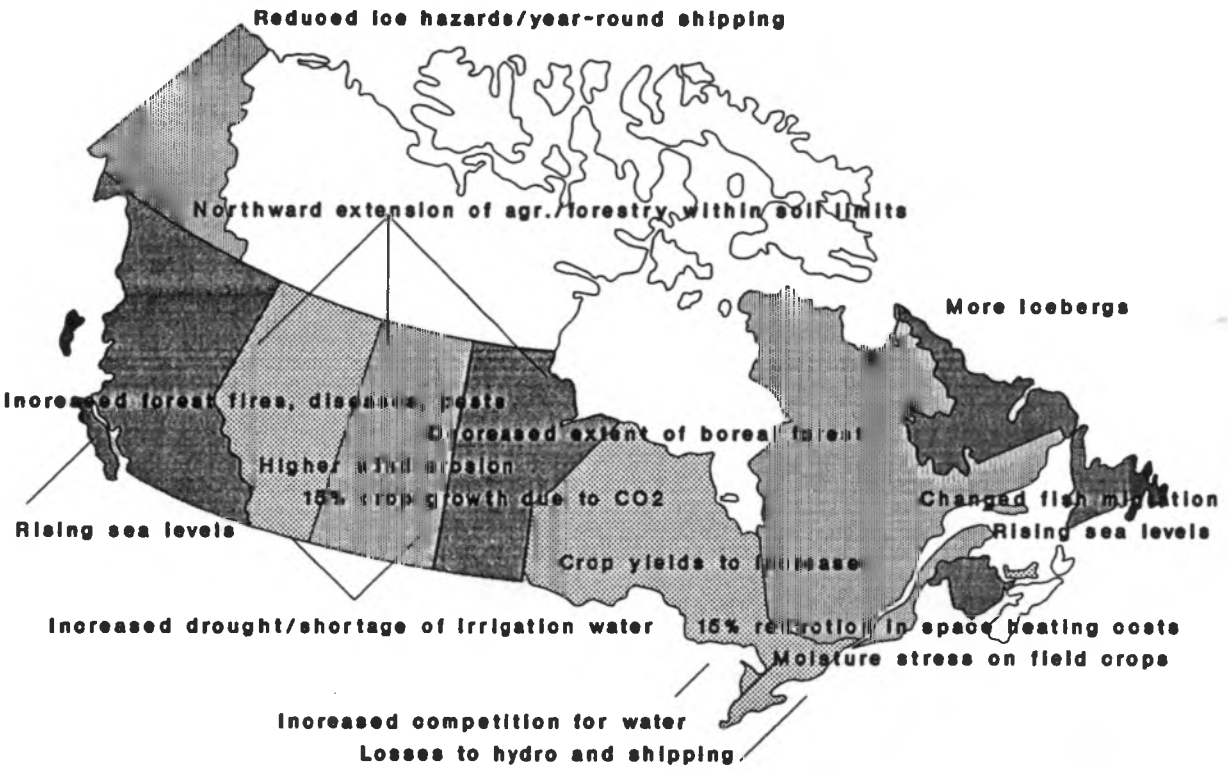
Although there has been some speculation about the possible implications of global warming for the Canadian urban system, regrettably there has yet to be any widespread recognition of the significance of present research findings. For example, as indicated in Figure 2, global warming is obviously a matter of considerable importance to many human settlements, particularly coastal communities vulnerable to rising sea levels. The effects of a one-metre rise in sea level on Saint John, N.B. and Charlottetown, P.E.I. for instance, include threats to residential, commercial and industrial areas, disruption of transportation, and inundation of sewage and industrial waste treatment facilities.[37] Although no comparable study has

yet to be carried out in the Vancouver area, it is reasonable to expect similar damage, if not much more, since much of greater Vancouver is built on low-lying land, some of it dyked.[38]

Other regional impacts on human settlements include the likely dislocation of many Canadian resource towns and villages. As fish sensitive to changing water temperatures migrate to more appropriate habitats, and as the lengthening of the growing season gradually shifts some forests and agriculture northward, both economic hardship and opportunity may be expected in areas dependent on these resources. Where climate changes rapidly outpace adaptation, mass extinctions will also strain resource communities.

Further, across the country, reductions in the water levels of lakes and rivers are expected to disrupt inland shipping routes, rates of fresh water pollution and consumption, recreational patterns, and hydro power. In the Great Lakes Basin, a projected drop in mean water levels will profoundly impact the environment and economies of the surrounding 40 million Canadians and Americans.

FIGURE 2
THE "GREENHOUSE" EFFECT ON CANADIAN HUMAN SETTLEMENTS



(Source: Keating, M., Environment Canada. 1989)

2.3 Implementing Community Sustainability

In light of these potential impacts, as mentioned above, it is the responsibility of all sectors of the economy to explore and pursue the avenues through which the concept of sustainable development may be applied to their respective jurisdictions of responsibility. Viewing the house a system within a larger community system, the challenge of residential sustainability presents itself on two separate fronts. The first is the challenge of developing a more environmentally benign, or a more sustainable dwelling unit. The second is to situate this dwelling unit in the broader community context under the guise of a more sustainable urban planning and development process. Each of these two challenges are discussed in turn below.

2.3.1 Towards More Sustainable Housing

Our houses are all made with, and operate on products from our surrounding environment. From the forest and the pits and quarries, to the land ultimately consumed, housing is an environmental industry. It is a major consumer of natural resources in the building stages, and it is a major consumer of energy and water in the occupancy stages. Further, the household constitutes the basic social unit in Canadian society and is a major consumer of goods and services which adversely impact the natural environment.

Housing, the economy, the environment and society are therefore inextricably interwoven. Figure 3 is an initial attempt to flesh out the relevant linkages. The figure highlights the main pressures being placed on those fundamental resources which are universal housing inputs - energy, land and water - and relates these impacts to broader community planning and house-specific issues.

FIGURE 3

ISSUES SURROUNDING THE DEVELOPMENT OF MORE SUSTAINABLE COMMUNITIES

ELEMENTS OF ONGOING ENVIRONMENTAL STRESS	RELATIONSHIPS WITH THE CANADIAN HOUSING SECTOR	
Global Issues:	**Community Planning Issues:**	**House-Specific Issues:**
ENERGY		
- climate change - air/water/land pollution - competing uses - diminishing resources	- soft energy paths * renewable, decentralized supply systems - energy efficient urban planning * buildings * inter/intra-urban transportation - residential energy efficiency per capita * floor space/person	- in-house energy efficiency * behaviour * technology - energy intensity of building materials * wood, steel, cement... - energy intensity of construction, renovation and demolition * prefabrication * reduce, reuse, recycle
WATER		
- pollution and consumption - climate change - competing uses - diminishing resources	- adequacy of municipal waterworks and wastewater systems * urban runoff, wastewater, sewage * government financing * user-pay principle	- in-house water efficiency * behaviour * technology - landscaping * plant species
LAND		
- land degradation * deforestation * loss of fertility * toxic and municipal waste * contaminated land - land use change * agricultural to urban * wilderness to recreation - climate change - competing uses - diminishing resources	- urban sprawl - urban intensification * infill housing, granny flats, etc. * accessory apartments, home-sharing, etc. - urban growth areas * demographics * satellite cities * growth centres	- house type * adaptability * flexibility - residential construction waste * reduce, reuse, recycle - household solid waste * reduce, reuse, recycle

Based on the above figure, the concept of sustainable development is relevant to Canadian housing in the planning, building, occupancy, and demolition stages of the dwelling unit's life cycle. Some of the key house-specific and broader community issues related to this life-cycle include:

House-Specific Issues - Building, Occupancy and Renovation/Demolition Stages:

Building Stage:

1) The energy intensity of building materials: *For example, the typical woodframe house requires approximately one-third less gross energy than do the main alternatives, steel or concrete.*[39]

2) The land required for residential construction waste: *An average of more than 2.5 tonnes of waste is produced in the construction of one new dwelling unit, and as much as 10% of all the lumber purchased for construction ends up as waste.*[40]

Occupancy Stage:

3) The energy spent to operate existing dwelling units: *Residential end-uses account for approximately 20% of total energy demand in Canada.*[41]

4) The fresh water required by the occupants (largely determined by household water-consuming appliances and lawn watering): *Municipal water use, of which the residential component accounts for over 63%, has undergone a general upward trend, rising from 3,157 million m^3 in 1972 to 4,263 million m^3 in 1981.*[42]

5) The land required for household waste: *The average Canadian generates about 1.7 kg of garbage per day.*[43]

Renovation/Demolition Stage:

6) The land required for renovation and demolition waste: *In a 1989 survey of 100 licensed renovation firms, it was determined that over a 12 month period, over 8,000 re-usable items were sent to landfill sites: 711 kitchen sinks; 455 bathtubs; 570 refrigerators; 3,777 interior doors; and 2,611 exterior doors.*[44] *There are tens of thousands of licensed renovation firms across Canada and countless informal operations adding to these numbers on an ongoing basis.*

Broader Community Issues - Planning Stage:

1) The land required for residential subdivisions: *Residential development patterns and the roads they necessitate typically consume over 50% and 20% respectively of the average city's total land area.*[45]

2) The resource and energy intensity of the infrastructure required to service prevailing residential development patterns: *For example, a single-family detached house requires approximately four times more linear infrastructure per unit than a duplex.*[46]

3) The energy required to commute to and from existing dwelling units: *Fully 77% of all Canadian households own one or more automobiles, and 73% of all journeys to work are made by car.*[47]

4) The housing stock's ability to respond to changing demographics and values, and hence changing housing demands and needs: *For example, the 65+ age group will grow significantly from 1981 to 2001 (2.8 to 3.9 million), and within the group, the percentage made up of the over 75 population will increase from 36% to 44%.*[48]

5) The pollution of receiving waters by residential wastewater discharges (largely determined by the adequacy of sewage treatment facilities): *Apart from obsolete and deteriorating systems all over the country, as of 1985, some 8 million Canadians still resided in municipalities where no sewage treatment had yet been provided to protect their receiving waters.*[49]

6) The pollution of receiving waters by urban runoff (largely determined by the amount land covered with impermeable surfaces and the treatment of storm water runoff): *A 1977 study of Washington D.C. concluded that the concentration of suspended solids in water from city streets was 104 times greater than effluent from secondary sewage treatment plants; the lead concentration was 1,025 times higher.*[50]

All of these issues underscore different problems that have emerged as a result of prevailing patterns of residential development. Fortunately, however, the solutions to these problems are rarely issue-specific. For example, evidence suggests that improving the energy efficiency of urban planning vis-a-vis both buildings (envelope efficiency) and transportation systems, would increase urban densities. This would not only reduce the amount of otherwise renewable land that has to be paved over to accommodate housing, and consequently mitigate the problem of urban runoff's impact on receiving waters, but would offset the usual embodied energy and resource intensity of sprawling development patterns. The argument can also be made that increasing the heterogeneity or "mixity" of land uses that urban intensification usually implies, tends to yield a variety of social benefits, including: increasing the convenience for those households that do not fit the suburban "nuclear-family mold"; and enhancing street life and hence social interaction, urban safety, and neighbourhood economic viability.

What is required for these changes of substance to be realized is a cross-sectoral decision-making process comprehensive enough to consider all of the issues, and sensitive enough to evaluate development alternatives, and their inherent trade-offs, in a manner consistent with changing attitudes, perceptions and values. The community planning process is as appropriate a procedure as any in this respect, given the predominantly urban context of most Canadian settlement issues, and the historical significance of planning as an agent of urban change.

2.3.2 Towards More Sustainable Community Planning

Community planning means many different things to many different people. It is not so much a well defined subject as it is a core area where the inquiry may be spatial or non-spatial and the context urban or rural. Concerned with the past, present and future, it is an area within overlapping fields of study embracing social, economic, political, psychological, anthropological and technological factors. Quite naturally from its origins in the movement for social and sanitary reform in the nineteenth century, it has grown to concern itself with such issues as poverty, inequality, employment, crime, housing, population, social welfare, recreation, movement, education and more.

The community planner therefore, has an extensive responsibility, encompassing issues of location, movement, the use of land as a resource, and the design and implementation of physical proposals such as new towns, urban renewal and rehabilitation. Based on a balance of social, economic and environmental objectives, planner's are concerned with resolving competing claims for land, conserving existing development and resources where appropriate, and controlling and programming new development in the best possible way.

In planning for a community's environment, a planner will be called upon to prepare or assess several different types of plans. There are four basic possibilities. First, the planning approach may focus on development for already built-up areas or for undeveloped land. The types of plans that may have to be considered are: subdivision plans, redevelopment plans, site plans, and project plans, either singly or in combination. The second possibility, in the form of issue-specific plans, is that one or more component districts of a community - the CBD, residential neighbourhoods, waterfronts, etc. - may warrant special consideration. Third, functional plans may be developed for the main functional elements of a community: the transportation network, the park system, community facilities, or housing. Fourth, and most important, is a comprehensive plan, or a Master Plan for the community as a whole, comprising all of the previous elements and concerns.

Implementation of these plans occurs via the design and application of appropriate tools in the form of land use regulations. In many instances, these regulations have been identified as the underlying cause behind both resource intensive development patterns and the affordability crisis. For example, in already-developed areas, zoning ordinances, which differentiate land use categories spatially, identifying the use to which a parcel of land may be put (and, if applicable, building type, height, floor area ratio, and placement on the lot), often prevent the development of a variety of innovative housing options, many of which either enhance affordability, reduce residential impacts on the natural environment, or both.

In vacant and undeveloped areas, subdivision control regulates the splitting up of land for development to ensure that plans meet local standards for health, safety and convenience. Central to subdivision control are the actual land development standards used to appraise the design of the proposed subdivision. These standards - land use standards, site-servicing standards, and site-planning standards - are also the subject of considerable controversy, given their often adverse impacts on housing affordability and resource efficiency. For example, site-servicing, or engineering standards, related to the provision of infrastructure such as roads, storm and sanitary sewage, drainage, water supply, and utilities, often implicitly encourage dispersed developments at relatively low densities. This in turn requires more capital investment and resource input per dwelling unit, aggravating both affordability and housing's impacts on the environment. Many municipalities' so-called "gold-plated" land development standards have, therefore, been identified by urban researchers as requiring change under the auspices of municipal regulatory reform.

Other targets for change include fundamental urban planning concepts routinely employed in subdivision design. From its origins in the social reform movement, urban planning priorities have shifted from issues related to health, to economics, to family considerations. The Canadian planning profession evolved in this manner and, along with its British and American counterparts, generated a rich array of planning concepts that continue to be used today. Presently, concepts such as the **Garden City Concept**, the **City Beautiful Movement**, the **Garden Suburb**, the **Neighbourhood Unit**, and finally the **Radburn Plan** continue to be drawn upon by Canadian planners as heavily as those from any other era. Since the end of World War II, there was hardly a metropolitan suburb planned in Canada that did not incorporate the following Radburn principles to a degree:

1) **The superblock** an area of 12-20 ha with major roads on the perimeter so that through traffic would not intrude into housing groups;
2) **Specialized roads** that would allow different traffic needs to proceed efficiently with minimum impact on the community;
3) **Separation of pedestrian and automobile** by a system of walkways in different places and at different levels where they cross;
4) **Houses turned around** facing gardens and parks instead of streets, with the latter becoming mainly service lanes for clusters of houses; and
5) **Parks as the focus** of the neighbourhood , with open space left in the centre of superblocks and joined from one to the other in a continuous park.[51]

Given the remarkable success of these types of neighbourhoods throughout the last four decades, the above urban planning principles and practices, the product of various public health, housing and environmental movements, have obviously accommodated an acute demand for literally millions of detached and semi-detached ground-oriented dwelling units. Ironically, however, while initially relieving the problems of local pollution and urban squalor, the conceptualization and mass implementation of these garden-oriented suburban communities has inadvertently contributed to today's more far reaching environmental problems.

2.3.3 Affecting Change

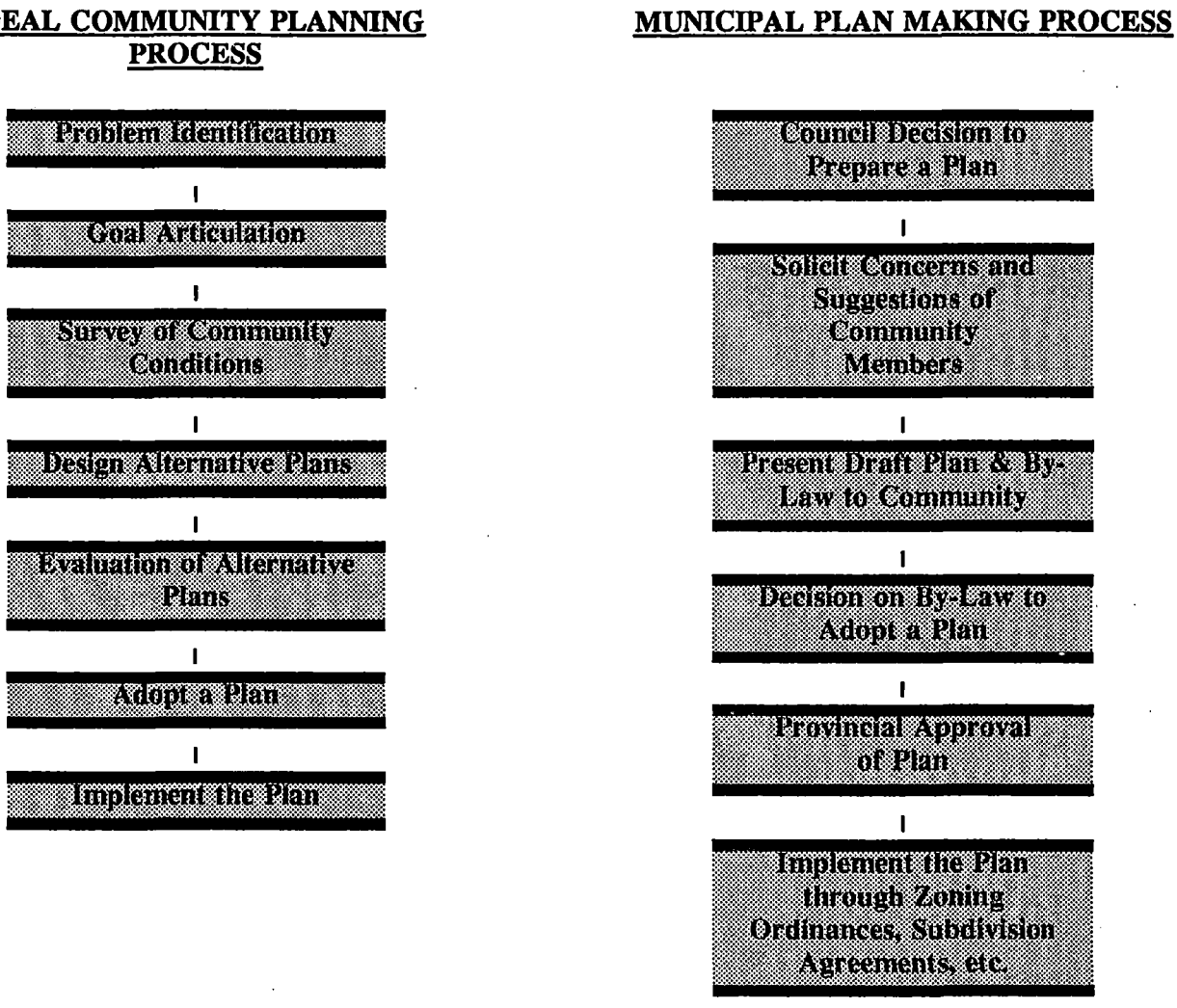
What is required to affect the necessary changes in the areas of land development standards and general planning concepts, is the incorporation of sustainable urban development principles, as the number one priority, into the municipal plan-making process and the ideal community planning process (refer to Figure 4). Hence, whereas lawyers, architects, and engineers have, and continue to play a substantial role in planning for the physical environment of a community, ecologists and environmentalists will now be required to become more actively involved.

This has, in fact, been the case in recent years and has led to the development of new, more ecosystem-oriented planning tools such as environmental impact assessment (EIA). And while EIA has yet to receive any widespread application, particularly in the urban context, it has contributed to the emergence of a new point of view and provided the forum for this point of view to be heard. This is crucially important with respect to the following overall objectives of planning:

1) the use of land to the best advantage;
2) the need to address social issues, such as the problems of the inner cities;
3) the need to assist in economic development and regeneration by improving the ability of the particular area to attract investment;

4) the maximum improvement in physical conditions that can be obtained within the limits of available resources, in accordance with human needs and priorities;
5) surroundings of quality and beauty that will inspire and enrich human existence at home, at work, and at leisure; and
6) the conservation of natural resources and beauty and worthwhile historical and architectural human creations.

FIGURE 4



(Source: Hodge, G. 1986)

Whereas the fourth objective - the maximum improvement in physical conditions that can be obtained within the limits of available resources, in accordance with human needs and priorities - used to be compatible with single-family detached houses for all, a new point of view, supported by EIA, could easily redefine it to mean something completely different.

The community planning process therefore, does not necessarily require a complete overhaul as much as it requires fine tuning; recall that sustainable community development is the application of a principle, not an end result. As such, what is required is a fundamental shift in the prevailing planning paradigm; that is, a move away from solely economic, "utilitarian" decision-making (cost-benefit analysis), largely based on "technocentric" environmental ideologies, to a less "technocratic" approach, supported by a more "ecocentric" ideology (refer to Figure 5).

FIGURE 5

ENVIRONMENTAL IDEOLOGIES[52]

Ecocentric		Technocentric
Bioethic	Self-Reliant Community	professional expertise
indispensibility of nature	communal self-sufficiency	rational, objective, efficient
natural rights	participatory democracy	objective and interventionist
natural morality	small-scale organization	

(Source: O'Riordan, T. 1977)

Overall, the challenge is to evolve a planning process which is not the captive of special interests, which functions as much as possible on collegial rather than hierarchical lines, and which provides an avenue for the vital involvement of would-be beneficiaries. After all, modern urban planning philosophies, however much their political and economic premises may diverge, share the abstract goal of maximizing the good of the greatest number of urbanites.[53] Today, more than ever, this necessarily presupposes a considerable degree of environmental responsibility. What will be required is leadership at all levels of government to help ensure that this responsibility is meaningfully incorporated into all aspects of the community planning process.

CONCLUSION

Given today's dominant development modes, present institutional arrangements, and existing "hard" technologies, the shift to sustainable development will be a major undertaking for any society. Becoming a sustainable society requires that we learn to live within our ecological means while restructuring the economy on a foundation of new environmentally benign technologies.[54] The transition may be stressful but it also ripe with economic potential. Those industries, companies, and nations that recognize the potential early enough will build not just ecologically harmless businesses, or economies, but will also become the best at fixing others' mistakes.[55]

The Brundtland Report states that by the turn of the century, almost half of humanity will live in cities. By the year 2000, Third World cities could grow by another three-quarters of a billion people. This suggests that the developing world must, over the next several years, increase by 65% its capacity to produce and manage its urban infrastructure, services and shelter merely to maintain today's often

extremely inadequate conditions. In industrial countries, urban issues such as, environmental degradation, inner-city decay and neighbourhood collapse, will be among the most notable.

In this context, the potential for CMHC lies in developing an expertise in sustainable housing and marketing this expertise to a world which will undoubtedly be in much need of the newly developed skill. The early development and export of ecologically sound technologies in the field of rural, regional and urban planning and development could also bring immediate profits to Canadians and could prove to be a fruitful and sustainable growth industry.

The next research paper in this series, Towards An Investigation Of Sustainable Housing, will begin to examine more closely the impacts of prevailing patterns of residential development on the natural environment, and the opportunities that exist for housing to become more sustainable in the future.

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